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AUTHOR	Cwikla, Julie
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ABSTRACT

This report examines the top Third International Mathematics and Science Study-Repeat (TIMSS-R) performers and compares Delaware classroom environments with those of the top performing students. Data analyses show that Delaware's average class size is larger than any of the top performers, and student attendance, skipping, and tardiness problems are more severe in Delaware than in any top performer. The majority of Delaware students are taught mathematics by teachers who did not major in mathematics or mathematics education, which is different from the top performers. It is shown that teachers' professional development opportunities are not as plentiful in Delaware as in the top performing schools, and teachers in the top performers participate in significantly more professional classroom observations than Delaware teachers. (KHR)

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TOP TIMSS-R MATHEMATICS PERFORMERS:

WHAT ARE THEY DOING DIFFERENTLY?

Julie Cwikla, Ph.D.
Mathematics Education
University of Southern Mississippi

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INTRODUCTION

The Delaware Science Coalition performed at the National and International averages in both mathematics and science (See Figure 1) as reported in previous analyses of the Delaware TIMSS-R data (Cwikla, 2001).

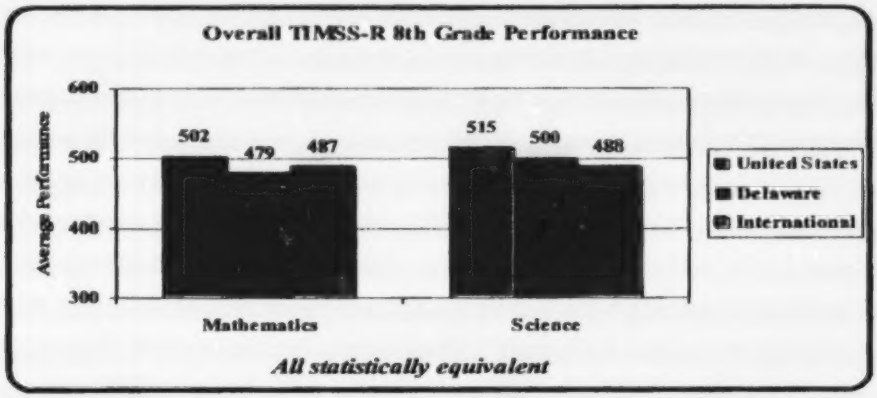

Figure 1: Comparison of Average Performances of U.S., DE, and International.

However, Delaware was significantly outperformed by regions and states with similar characteristics such as demographics and geographic proximity (See Table 1).

State/ Consortia	% Minority	# Tested	Math Avg
DE Science Coalition	37	1268	479
Illinois (IL)	35	4781	509
Maryland (MD)	45	3317	495
Michigan (MI)	18	2623	517
Oregon (OR)	20	1889	514
First in the World (1stWrld)	26	750	560
Montgomery County (Mont)	21	1096	521
Southwest PA Collaborative (SWPA)	13	1538	517

Table 1: Comparison of Similar states and Consortia

The performance difference suggests that Delaware educators could benefit from the examination of top performers' mathematics education systems. This technical report will highlight characteristics of states and entities that consistently outperformed Delaware. There is no one characteristic that is predictive of high mathematics performance. But the examination of various classroom features and teacher characteristics of higher performers, offer some direction for educational policy.

CLASSROOM ENVIRONMENT

Class Size

Optimal class size is debated in the literature. Although, the difference in class size is one student in some cases, Delaware has the largest average class size compared to the higher performers, averaging 29 students (See Figure 2). The majority of the top performers have an average mathematics class size of 24 students.

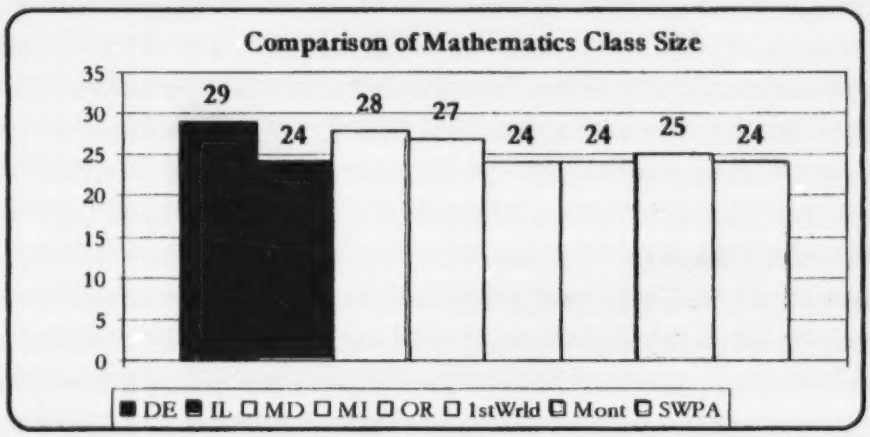

Figure 2: Comparison of mathematics class size.

Student Attendance

Delaware schools report class attendance problems significantly more than any other state or entity described here, all of which are higher mathematics performers (See Figure 3). Montgomery County has not been included in this figure because data were only available for 50% of the students assessed in the TIMSS-R.

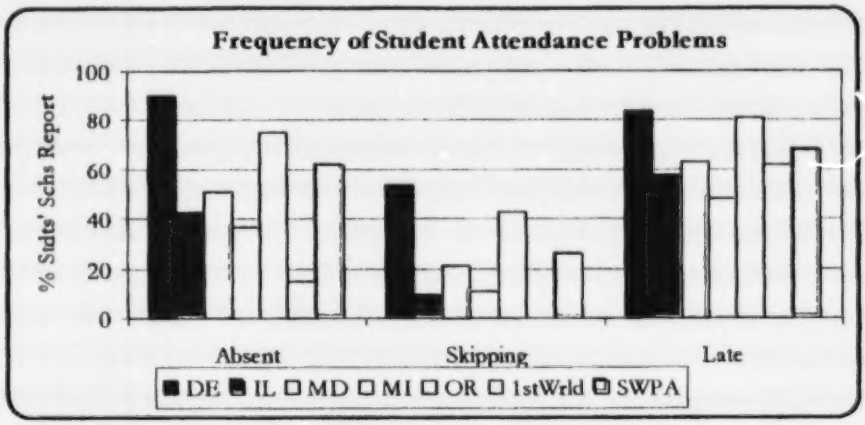

Figure 3: Schools report of student attendance problems.

TEACHING & TEACHERS

The mathematics strands emphasized by the top performers were different from the Delaware classrooms. Delaware emphasized a combination of Algebra, Geometry, and Number more than any other group (See Figure 4). The majority of the higher performers seem to emphasize two areas of mathematics, whereas Delaware's reported mathematics curricula in 1999, is distributed across all Algebra, Number, Other, and a combination of all three.

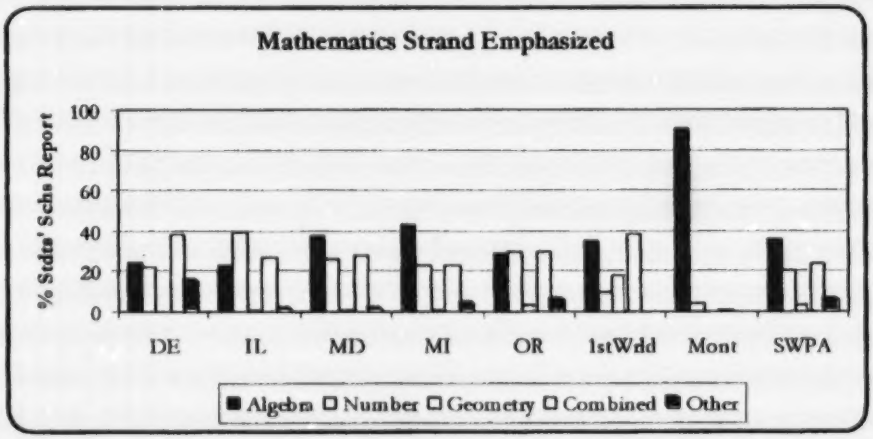

Figure 4: Mathematics strand emphasis across states and entities.

The mathematics classroom activities and modes of instruction were not significantly different across states and entities when student and teacher data were linked. For example teachers and their students have somewhat differing reports about classroom activities. This combined with

the only minor differences between Delaware teachers' report about classroom practice and teachers' report from the high performers, made the inquiry fruitless. However teacher preparation across Delaware and the high performers were significantly different.

Teachers' Degrees

The majority of Delaware students are not being taught by a mathematics teacher with either a mathematics or mathematics education major. The majority of students in the higher performing states and entities are taught by teachers with degrees in mathematics or mathematics education (See Figure 5). All the states and entities except Montgomery County have nearly double the percent of students taught by teachers with mathematics majors teaching eighth grade than Delaware. A separate study (Cwikla, 2002) indicated that the top performers in Delaware were taught by teachers who held degrees in mathematics or mathematics education. **Over 50% of the students in Illinois, Michigan, First in the World, and the Southwest Pennsylvania Consortium are taught by teachers with mathematics majors.** These comparative data support the importance of middle school teacher preparation and likely the accompanying content knowledge of those majoring in the content area they teach on students' TIMSS-R performance.

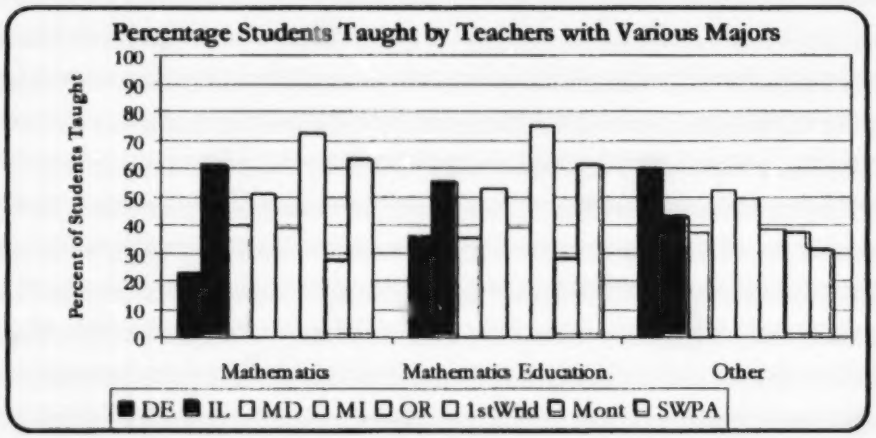

Figure 5: Comparison of mathematics teachers' degree majors.

Teacher Professional Development

One final significant difference between Delaware and the high performers is teachers' professional development (See Figure 6). The high performers in general, organize more out-of-district professional development opportunities and encourage more conference participation than

Delaware developers. First in the World is also a clear outlier in the teacher network group with most teachers participating in networks as well as the other three formats.

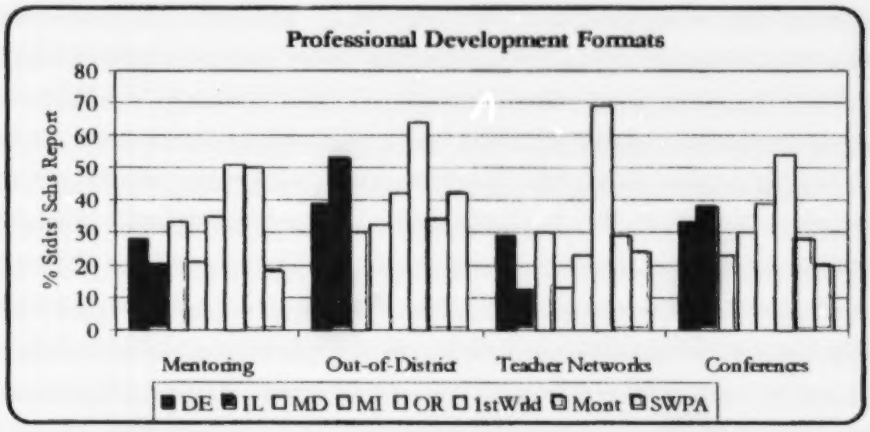

Figure 6: Forms of professional development across states and entities.

First in the World also supports professional teacher observations. Figure 7 displays the significant difference between Delaware and most of the high performers in both observation of other mathematics teachers and being observed themselves.

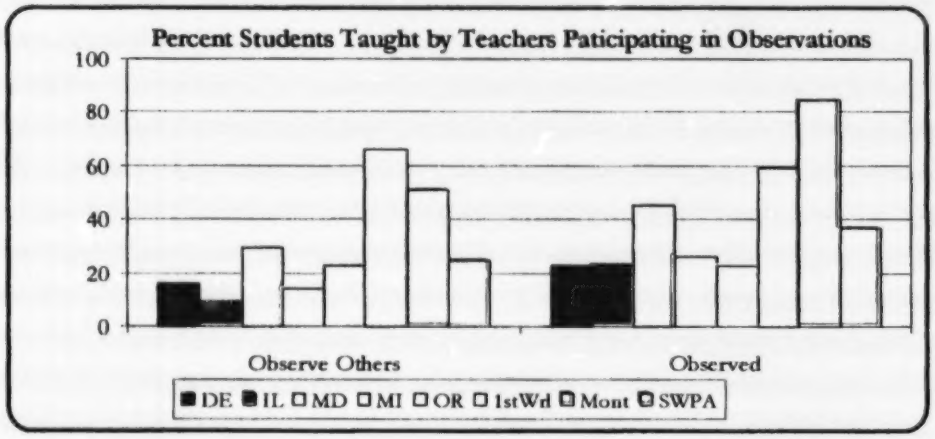

Figure 7: Teacher professional classroom observations

CONCLUSIONS

This study of the top TIMSS-R performers made explicit some of the differences between Delaware classroom environments and those of the top performing students.

- Delaware's average class size is larger than any of the top performers.
- Student attendance problems, skipping, and tardiness problems are more severe in Delaware than in any top performer.
- The mathematics strands emphasized are different in Delaware than in the top performers.
- The majority of Delaware students are taught mathematics by teachers who did not major in mathematics or mathematics education. This is considerably different from the top performers.
- Teachers' professional development opportunities are not as plentiful in Delaware as in the top performers.
- Teachers of the top performers participate in significantly more professional classroom observations than Delaware teachers.

Cwikla, J. (2002). *Differential mathematics performance on the TIMSS-R across Delaware student of color.* Technical Report: University of Southern Mississippi.

Contact the author with comments/questions: Julie_Cwikla@yahoo.com

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Organization/Address: UNIV. SOUTHERN MISSISSIPPI 244 LOVERS LN OCEAN SPRINGS, MS 39564	Telephone: 228-547-6547 FAX:
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